

at the hands of experienced systematists. The concluding chapter, dealing with the bearing of palæobotanical evidence on plant evolution, is full of interest, and particularly valuable as being written by one who possesses both a wide knowledge of the available data and the power of critically weighing the evidence. Referring to the comparative study of species of fossil plants, Zeiller writes:

“Les Espèces, comme les genres, se succèdent par voie de substitution et non par voie de transformation graduelle, et il en paraît être de même à tous les niveaux.”

A very useful bibliography of writings referred to in the text is given at the end of the volume. A. C. S.

#### PHOTOGRAPHY IN NATURAL COLOURS.

*Lehrbuch der Photochromie (Photographie der natürlichen Farben)*. Von Wilhelm Zenker; neu herausgegeben von Prof. Dr. B. Schwalbe. Pp. xiii + 157. (Braunschweig: Vieweg und Sohn, 1900)

IN 1868, after long study and repetitions of Edmond Becquerel's experiments on photochromy, Dr. Wilhelm Zenker himself printed and published a “Lehrbuch der Photochromie,” which contained a physical explanation of the colour-correctness of these photochromatic images. Zenker's book did not have a wide circulation—it would be difficult, perhaps, to name any one in England who has read it—and it was not until 1890 that Lippmann, by founding a *new* method on the principle suggested by Zenker, drew a slightly increased attention to Zenker's labours. That the attention was only slightly increased was due to two causes: firstly, the rather astonishing *results* of Lippmann and others helped to overshadow the *principle* of Zenker in the eyes of most people; secondly, among all those whose pursuits have any claim to be considered as scientific, English photographers are especially noticeable for their deliberate ignorance of the creative work of the past in photography.

For the latter reason, chiefly, the present writer has given, during the past year, a rather full analysis of Zenker's work in “Camera Obscura,” and we have now a reprint, in good *English* type, of the book. In the words of the preface, “The more modern researches on photography in natural colours have shown that the way and the explanations of modern attempts are connected in many respects with Zenker's ideas.” The volume contains besides a portrait of Zenker, a sketch of his life and index of his works by Prof. Gustav Krech; and, finally, Herr E. Tonn gives (pp. 131–157) an account of the further development of photochromy on the foundations of Zenker's theory. We shall notice these briefly in their order; but, with regard to the “Lehrbuch” itself, shall abstain from entering at all fully into the subject of its contents, as in the above-cited reference there is already a full account of it in English.

Wilhelm Zenker (1829–1899) cultivated many different branches of knowledge. His first papers (1850–1866) were zoological; the “Lehrbuch” was his first contribution to photography; and his other papers were on colour-perception (1867), photography and physical optics, astrophysics, and, in later life, meteorology. The “Lehrbuch,” however, is probably the most important of

his works, and it is to be hoped that now, with this excellent reprint, his methods will have some influence on English photography.<sup>1</sup>

The book is divided into three parts: (1) Considerations on colours (“Das Wesen der Farben”); (2) Account of his predecessors' work in photochromy (“Die Wiedergabe der Farben”); and the third part (“Theorie der Photochromie”), after an account of the theories of Seebeck, Becquerel and others, contains Zenker's own ideas (pp. 116–129). There are one or two useful notes to this section.

Herr Tonn's section, with one exception, seems very complete, and full references are given. It is, however, a pity that the very pregnant hint of Lord Rayleigh should be unnoticed (*Phil. Mag.*, 1887). Lord Rayleigh, independently of Zenker, and starting from totally different considerations, indicated in a footnote the Zenker principle, and even went farther; for not only did he seek to *explain* the results of Becquerel by this principle, but seemed to see the possibility of a *new* method of photochromy based on it. It would be interesting to have some account of Lord Rayleigh's then promised experimental investigations. If Herr Tonn knew this paper, it is difficult to understand how he resisted the temptation of comparing Rayleigh and Zenker—Zenker who was so clearly a non-mathematician.

The chief value of the book, the writer persists in believing, is not historical—for it *has* not had very much influence in the moulding of thought—but is in its spirit; the influence of its point of view and methods is needed above all at the present time for English photographers; this does not mean, of course, the small number of English *photo-chemists*.

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#### OUR BOOK SHELF.

*Die Harze und die Harzbehälter*. By A. Tschirch. Pp. viii + 417. (Leipzig: Gebrüder Borntraeger, 1900.)

THE author has spent eight years in collecting and arranging the scattered facts relating to the obscure group of organic compounds which are classified as resins by virtue of a common physical characteristic.

What Kekulé termed “the chemical lumber room” contained at one time a collection of similar obscure groups, such as the alcaloids, colouring matters, tannins, aromatic compounds, &c.; but since the year when that chemist gave to the world his benzene formula, the lumber room has been industriously ransacked and its contents dragged forth into the light of day. Perhaps the resins have received the scantiest share of attention; partly, no doubt, owing to the practical difficulties which they offer to the chemist.

We know nothing of the molecular state which finds its physical expression in these amorphous, translucent compounds, nor how to bring them into a condition of ascertained purity. How often does a promising research miscarry by the unwelcome appearance of resinous products! Nevertheless the mass of research which has accumulated on the subject fills 400 closely printed pages.

A great amount of this research gives very little indication of the nature of the resins themselves. The older chemists distilled them and obtained products such

<sup>1</sup> His work for the Paris Academy prize in 1868 stands in close relation to his theory of photochromy (see Fizeau's report, *Compt. rend.*, lvi., lxvii.). Zenker's memoir was never published, and Otto Wiener (*Wied. Ann.*, 1890, 1895) later and independently followed the same train of thought. (Cf. also Cornu, Poincaré, Potier and Berthelot, *Compt. rend.*, cxii.; and Drude, *Wied. Ann.*, xli., xliii.)